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Montana Dam Safety Outlet

No. 3 *Dam Safety Program, Montana Department of Natural Resources and Conservation* March 1997

PREPARING FOR RUNOFF

High Snowpack May Have Heavy Impact on Dams

by Gary Fischer, P.E., Manager of the Montana Dam Safety Program

This issue of the *Outlet* is dedicated to understanding and preparing for high runoff anticipated from the record snowpack in Montana. Dams are especially vulnerable to this threat, and it is up to all dam owners to anticipate and take appropriate action to guard against a potential failure. We have included articles from various entities to emphasize that the current snowpack is extremely high and the runoff this spring may have some very serious consequences. Appropriate action by the operators of dams can help reduce the impact of flooding as well as maintain the safety of their dams. By working together, I think we all can help to make dams safe during the runoff season.

A sound approach to preparing for the runoff is to reduce storage in our reservoirs before warm weather hits. It is likely that the water supply will be adequate this year. Filling the reservoir after the peak of the runoff would probably provide enough water, plus help maintain the safety of the dam. Operation of irrigation, stock, and recreation dams should now focus on safety as well as trying to maintain adequate storage. Reduction of storage goes against the nature of most reservoir owners. But to ignore the high runoff potential in most parts of the state and keep high storage levels in the reservoirs could result in unnecessary stress or erosion of the spillways. The insert article by the U. S. Bureau of Reclamation (USBR) indicates that most of the reservoirs they operate in Montana will likely have to be dropped to springtime levels well below normal to accept the anticipated runoff. The USBR is constantly monitoring the snowpack and runoff potential and are making adjustments for all their reservoirs as forecasted conditions change.

We hope that the articles in this newsletter will provide some resources for all readers to gain useful information on snowpack and runoff. In his article on page 2, Roy Kaiser advises people to call the U. S. Natural Resources Conservation Service (NRCS) for snowpack information, and the National Weather Service (NWS) for flood forecasts. The state Disaster and Emergency Services (DES) at 444-6911 is also a source for updated flood information. While a lot of owners have dams in areas that do not have snowpack or rainfall gaging stations, the various agencies still have some good information available from nearby gages on which informed decisions can be made on how to operate the dams. Ron Curley, DES director for Ravalli County, whose article on page 4 gives the local emergency response perspective, has been busy contacting dam owners about the runoff situation. Other local DES coordinators will be doing the same in their counties. Fay Stokes, project manager of the Pondera County Canal and Reservoir

. . . *continued on page 2*

for runoff (Continued) . . .
Company, describes in his article on page 3 how his company is preparing Swift and Lake Francis reservoirs for the snowmelt. A Dam Owners' Preparation Checklist has been included in this issue on page 3 to assist owners and operators in preparing for runoff. And last but not least, the Dam Safety Program is always available for assistance or information. Call us at (406) 444-6664/6613.

It is good to see so many people getting involved and preparing for this year's runoff. This spring may test many dams. I am confident that with cooperation and support we'll pass the test with flying colors.

SNOWPACK FOR WATER YEAR 1997

by Roy Kaiser, Natural Resources Conservation Service, Bozeman

Water Year 1997 so far has been well above average and set many new records from its ineeption. The snowpack began building earlier than usual this year and continues to set new snow water eontent records.

On January 1, 1997, nearly all of the major river basins in Montana set new snow water content records. By the time February 1 arrived, there were six major river basins that continued to set new reeord snow water contents. These basins were the Kootenai, Jefferson, Madison, Gallatin, Upper Yellowstone, and Lower Yellowstone. Even though other basins were not continuing to set new reeord snow water eontents, they were still, at a minimum, 30 percent above average. What this means to a water user or reservoir operator is that it appears we should have stream flows and reservoir inflows this spring that are above average to well above average and flows that have not oecurred in many years. Streamflow foreeasts across the state on February 1 were 43 percent above average and 24 percent above last year's forecasts at the same time. Streamflow forecasts in the Jefferson River basin averaged 66 percent above average and 41 pereent above last year; the Madison averaged 44 pereent above average and 28 percent above last year; the Gallatin averaged 50 percent above average and 39 percent above last year; and the Smith-Judith-Musselshell basins averaged 47 percent above average and 7 percent above last year. These forecasts are given in a generie discussion to make the reader aware that our streams are likely to run very high this spring, and in many areas the volumes and snowmelt peak flows eould be at new records. Depending upon the weather during spring snowmelt, peak flows could exceed previous maximum highs and have long durations.

Reservoir operators need to monitor the snowpack earefully over the next few weeks to make critieal reservoir operating decisions. In many basins there is adequate snowpack to fill reservoirs that should be drafted early in antieipation of large runoff potentials.

Early planning for this year's reservoir operations will be critical to ensure public safety, prevent reservoir damage, and have a full reservoir after the snowmelt peak has passed.

For additional information, eontact your local Natural Resourees Conservation Service (NRCS) Field Office. It ean provide local snowpack and streamflow information to help water users and reservoir operators plan their strategies for this spring's potentially high runoff. Flood information can also be obtained from the National Weather Serviee offiees in Billings, Great Falls, Glasgow, and Missoula.

RESERVOIR OPERATIONS

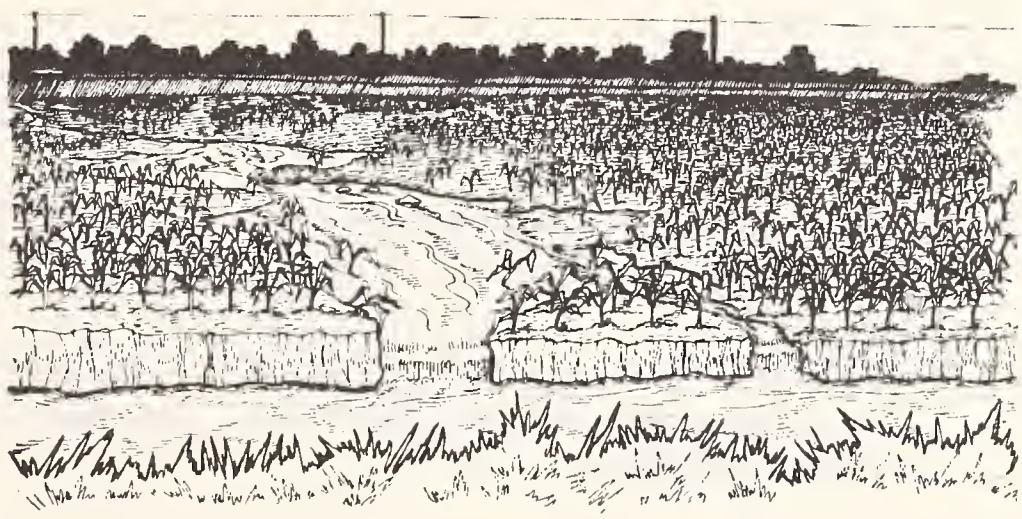
by Fay Stokes, Pondera County Canal and Reservoir Company

The possibility of floods in our area seems to be more apt to happen this year. The snow pack in the mountains is quite a bit above normal, and with the threat of February, March, and April moisture ahead of us, floods could happen. In our case, Swift Dam only holds 30,000 acre-feet, so consequently it's too small to handle a major flood of Birch Creek. However, we can drain it down some in the spring and divert the flow into Lake Frances, which is an off-stream storage reservoir.

The problem is the capacity of the canal feeding Lake Frances from Birch Creek, which is 700 cubic feet per second. During the high flood waters, most all of the water has to go down the creek, causing flooding. Depending on the amount of snowpack, how much spring and early summer rains we get and how warm the temperatures get will be the governing factors on how severe the possibility of the floods. We have met with the local department heads and Disaster and Emergency Service personnel this month and are getting prepared for the worst, whether it happens or not.

DAM OWNERS' RUNOFF PREPARATION CHECKLIST

- ✔ Spillway clear of debris and ice
- ✔ Outlet gate in good working order
- ✔ Trash rack clear of debris
- ✔ Riprap adequate
- ✔ Operation and maintenance procedures reviewed



- ✔ Emergency Action Plan up-to-date
- ✔ Owner inspection/dam walkover completed (Don't forget to document your inspection!)
- ✔ Procedures to monitor inflows to reservoir and reservoir levels in place. (Keeping records of inflow, snowpack and reservoir levels can help you plan for next year's runoff).
- ✔ Local Weather Service contacted: Ask them to call you if any extreme storm event occurs in the basin above your dam.
- ✔ NRCS (Roy Kaiser, Bozeman, 587-6991) or local NRCS office contacted for updated snowpack conditions and possible runoff predictions

PLANNING

Disaster/Emergency Services Considerations

by Ronald D. Curley, Director, Disaster and Emergency Services for Ravalli County

There's snow, snow, everywhere, and where's it going to go? Well, that's what it looks like for now, and the experts tell us that this has been one of the most significant years for record snow fall in Montana. The water content has been, according to the Department of Agriculture, at "all time record levels." That means we may be on the front end of a major problem, if all of this white stuff decides to come off the surrounding mountains quickly. I am sure that all of us will be watching the weather conditions and river/stream water levels very closely over the next few months.

There are a number of important suggested actions for dam owners to consider as a matter of public safety and preparation for this year's runoff. It is important to keep the lines of communication open to all who have a need to know without alarming the public unduly. Here are a few suggestions --

- Communicate with key officials your emergency action plan and review the need for any changes with your local Disaster and Emergency service coordinator/emergency manager.

- It is important to keep the public informed of what the reservoir/dam capacity is and what that means to people downstream from the reservoir/dam.

- Dam owners may wish to pre-stage emergency sandbags and sand to mitigate problems associated with heavy runoff (e.g., earthen dams).

- Keep your DES/EM official fully apprised of any ongoing or needed repairs, actions being taken, the potential dangers, expected problems, changes in inundation areas, etc.

- Make sure your telephone numbers are up to date-in-your emergency action plan and that key officials have these in case of an emergency.

- If you do not have an emergency action plan, put one together. You may request assistance in formatting such a plan through the DNRC Dam Safety Program or your local emergency management office.

- Identify to your local emergency management office all people downstream from your reservoir/dam, if they are in a potential inundation area.

- Since the snowpack is so high this year, dam owners may wish to consider the issue of pre-releasing water from the reservoir/dam in order to try to mitigate damages associated with too much water and debris running over the spillway too quickly.

It is important to all of us that we not allow ourselves to move into a sense of complacency during the time preceding what may be a significant meltdown and runoff period this spring and summer of 1997. Planning and preparation are important issues.

Additional information may be obtained from the State Disaster and Emergency Services Office, Helena (Mr. Larry Akers -- 406-444-6960) or, the Montana Dam Safety Program (406-444-6664/6613).

BUREAU OF RECLAMATION PREPARES FOR RUNOFF FROM RECORD HIGH SNOWPACK

Reclamation continues to prepare for the runoff expected from the record high snowpack. Many reservoir storage levels are being evacuated to unusually low levels to make room for the spring snowmelt runoff. Depending upon how the snowmelt runoff occurs, many reservoirs may be at unusually low levels prior to the beginning of the recreation season. These low levels are required to store the expected large runoff without making large releases from the reservoirs that would cause flooding downstream. Robert Schroeder, Area Manager for Montana says some boat ramps or marina operations may be affected by the low water levels this spring and at times, streamflows downstream of the dams may be at unusually high levels. Boaters and fishermen are encouraged to use extreme caution during these times. Reclamation will continue to operate the reservoirs to maintain recreation facilities and meet the needs of the fisheries, but the first and highest priority, is public safety and the protection of property. Snowpack varies from 130 percent of normal in the Sun-Marias River Basins to 170 percent of normal in the Shoshone River Basin in northwestern Wyoming, a tributary of the Bighorn River Basin. This year's mountain snowpack is the highest of record in most watersheds. For more information, contact Tim Felchle with the Bureau of Reclamation at (406) 247-7318.

CLARK CANYON - EAST BENCH IRRIGATION DISTRICT:

On February 17, Clark Canyon was at elevation 5542.1 with 157,900 acre-feet of storage, 109 percent of average. This is about 4.0 feet below the top of the conservation pool level. Snowpack in the Beaverhead River Basin is 160 percent of average. Releases from Clark Canyon to the Beaverhead River have been increased to near 350 cfs and will be gradually increased to near 500 cfs during the next few days. Clark Canyon storage is expected to be drafted to near elevation 5541 by the end of March. At that time, the reservoir is expected to begin slowly filling to elevation 5546.1 by the end of June.

CANYON FERRY RESERVOIR:

On February 17, Canyon Ferry was at elevation 3780.4 with 1,431,600 acre-feet of storage, about 89 percent of average. This is about 16.6 feet below the top of the conservation pool. Snowpack in the Missouri River Basin above Canyon Ferry is 157 percent of average. Releases from Canyon Ferry to the Missouri River are being maintained at about 7,600 cfs. Canyon Ferry storage is expected to be drafted to near elevation 3770 by the end of April, about 75 percent of normal for this time of year. At that time, the reservoir is expected to begin slowly filling to elevation 3797 by the end of June.

LAKE ELWELL - MARIAS RIVER BASIN:

On February 17, Tiber Reservoir (Lake Elwell) was at elevation 2978.9 with 740,100 acre-feet of storage, about 104 percent of average. This is about 14.1 feet below the top of the conservation pool. Snowpack in the Marias River Basin is 129 percent of average. Releases from Lake Elwell to the Marias River are being maintained at 540 cfs. Lake Elwell is expected to slowly drop to near elevation 2978 by the end of February. At that time, the reservoir is expected to begin slowly filling to elevation 2993 by the end of June.

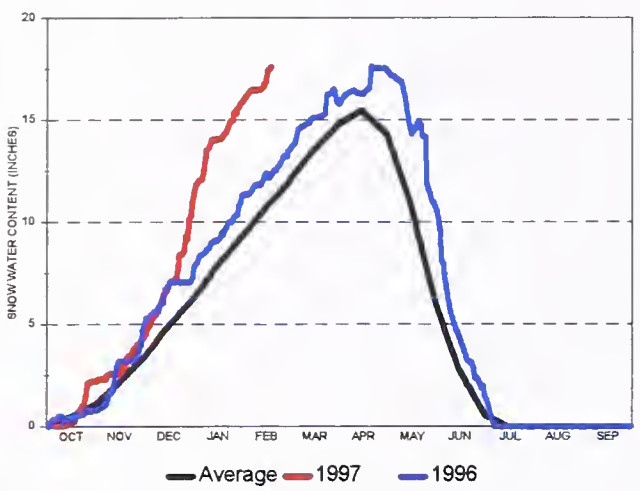
BIGHORN LAKE - YELLOWTAIL DAM:

On February 17, Bighorn Lake was at elevation 3609.8 with 802,000 acre-feet of storage, about 94 percent of average. This is about 30.2 feet below the top of the conservation pool. Snowpack in the Bighorn River Basin is 145 percent of average. Releases from Bighorn Lake to the Bighorn River are being maintained at about 4,200 cfs. Bighorn Lake is expected to be drafted to near elevation 3595 by the end of April, about 87 percent of normal for this time of year. At that time, the reservoir is expected to begin slowly filling to 3640 by the end of July.

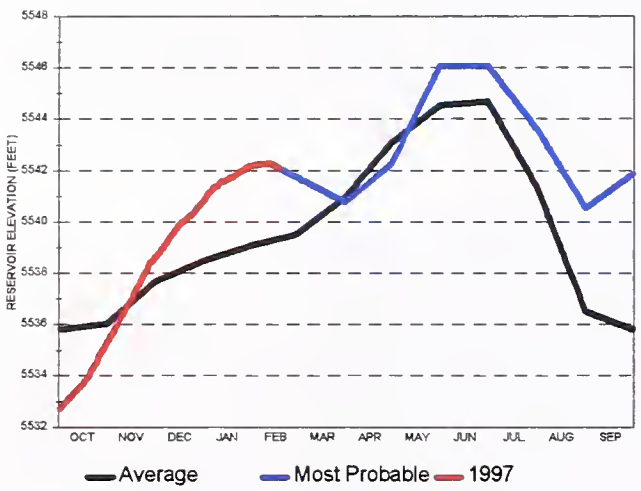
RECLAMATION RESERVOIRS

CLARK CANYON RESERVOIR

Snow Water Content

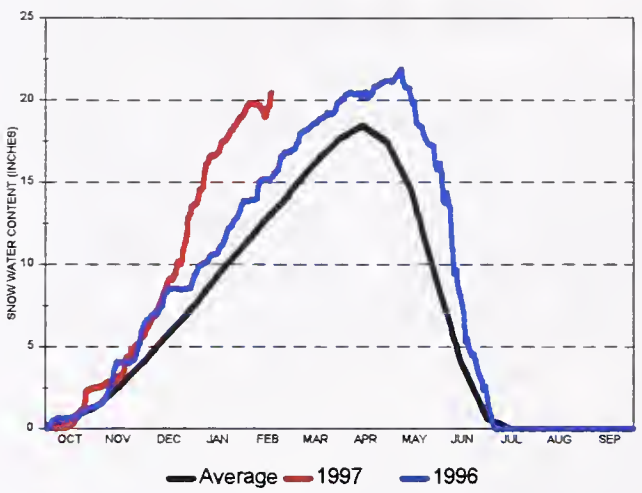


Reservoir Elevation

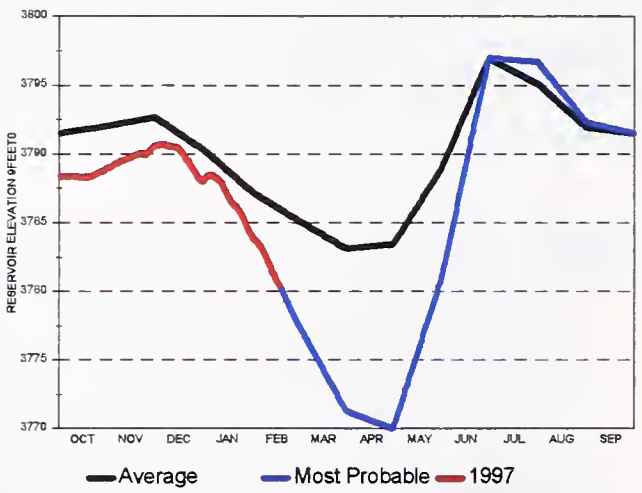


CANYON FERRY RESERVOIR

Snow Water Content

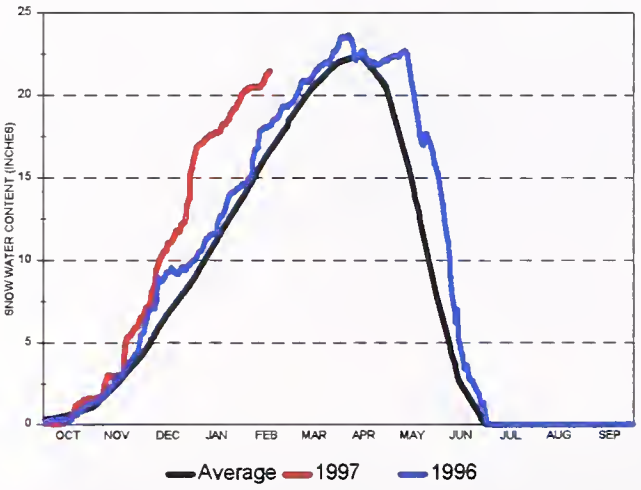


Reservoir Elevation



LAKE ELWELL (TIBER DAM)

Snow Water Content



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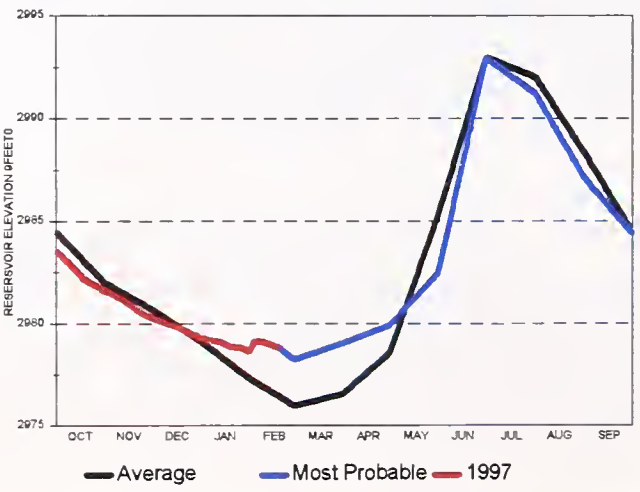
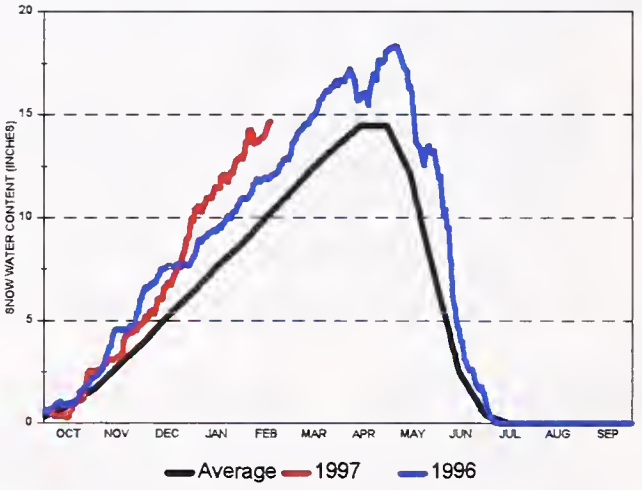
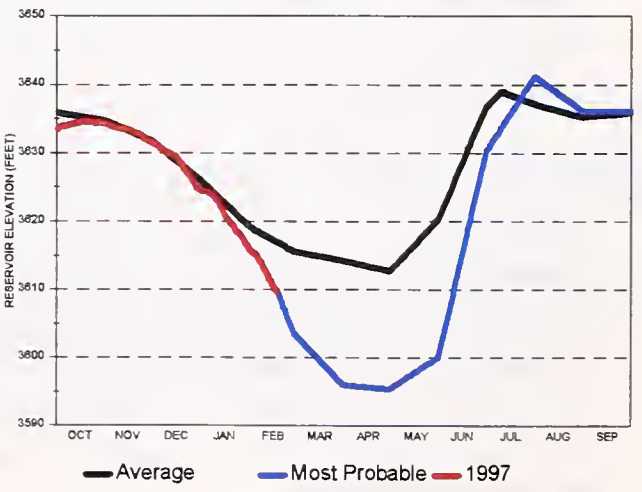


BIGHORN LAKE (YELLOWTAIL DAM)

Snow Water Content



Reservoir Elevation



Upcoming Training Opportunity

1997 Montana Dam Safety Seminar
"Design and Construction of Dam Filters and Drains"
May 6 -7, 1997
Colonial Park Hotel, Helena, Montana

Design

- Types of filters and drains
- Selection of drain pipe
- Hydraulic considerations
- Locating filters and drains
- Selection of filter and drain materials
- Geofabric applications

Construction

- Material source
- Equipment selection
- Material processing
- Potential problems
- Placement/Installation
- Construction specifications
- Construction quality control

This two-day technical seminar is intended for engineers, geologists, and other technicians involved in the design and construction of filters and drains. Although the emphasis will primarily be on dams, other applications for filters and drains will be discussed as well. The instructors are Ron Luehring and Allan Jumper, both of the U. S. Bureau of Reclamation's Geotechnical Services Center in Denver.

As always, we like to keep our registration fees as low as possible. Thanks to assistance from the U. S. Bureau of Reclamation, we are able to offer this seminar for a registration fee of $40.00. This fee will cover the cost of the lunches and meeting room rental for both days. We also have an arrangement with the Super 8 Motel in Helena (located across the street from the Colonial) for very inexpensive lodging. To obtain a registration form, or any other information, please call Michele Lemieux at 406-444-6613

Extreme Storm Study Continues

The DNRC-sponsored study of extreme precipitation events is nearing completion. The U. S. Geological Survey is conducting the study. The report for the first phase of the project, which documents the regional analysis of large storms, has been approved for publication and will be released soon. This publication will be used to compute a total rainfall depth for a storm of 2, 6, or 24-hour duration up to a 5,000-year return interval, anywhere in Montana. A draft report for the second phase, which analyzes the temporal distribution of large storms, is being distributed for peer review. A final report for the second phase is due this spring.

This new information will be used to estimate runoff for large storm events. For dams, the results will be used in determining spillway capacities. The next step will be to develop new spillway standards based on the consequences of failure, which will replace the old standards based in the probable maximum flood (PMF). As was mentioned in our last newsletter (October 1996), the Dam Safety Program is asking for volunteers to participate in a work committee to help develop the new standards. If you are interested in participating, please call Gary Fischer (444-6664) or Laurence Siroky (444-6816).

Tongue River Dam Rehabilitation Progress

The Tongue River Dam, located in Big Horn County Montana, is undergoing major rehabilitation. The rehabilitation is intended to accomplish three things: (1) to provide additional spillway capacity, (2) to provide additional irrigation water to the Northern Cheyenne Tribe, and (3) to enhance fish and wildlife resources and habitat in the Tongue River basin.

The project includes reconstruction of the primary spillway and stilling basin and construction of a new emergency spillway as a roller-compacted concrete (RCC) overlay on the earth dam. The existing low-level outlet works will be rehabilitated, and an auxiliary low-level outlet works will be installed. The reconfigured structure will increase the reservoir's capacity from 67,000 acre-feet to 80,000 acre-feet.

Construction of the project will be done in three major phases. Phase I, which began in August 1996 and will be completed in May 1997, includes road reconstruction, preparation of the dam site staging area, and production of aggregate. Phase II activities include construction of the RCC emergency spillway and construction of a cofferdam upstream of the existing spillway. Phase II construction is to begin in March 1997 and will continue through September 1997. Phase III activities will include the construction of the principal spillway and the auxiliary low-level outlet works. Phase III is scheduled to begin in October 1997.

The primary engineer for the project is ESA Consultants, Inc. of Bozeman, Montana. The lead contractor for Phase I construction is Empire Sand and Gravel of Billings. Phase II construction was recently awarded to Barnard Construction of Bozeman.

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MONTANA DEPARTMENT
OF
NATURAL RESOURCES AND CONSERVATION

WATER RESOURCES DIVISION

TONGUE RIVER PROJECT

MODIFICATION FEASIBILITY STUDY
SUMMARY

APRIL 1977

R.C. HARLAN AND ASSOCIATES
consulting engineers